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Temperature Measurements in the Taiwan Chelungpu-Fault Drilling Project

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Measurements of the temperature changes associated with earthquakes can be useful for studying the total energy balance, and especially the dynamic frictional levels during faulting of large earthquakes. However, such temperature anomalies across faults or temperature changes associated with earthquakes have rarely been observed. The Taiwan Chelungpu-Fault Drilling Project (TCDP) offers the opportunity to make temperature observations at about kilometer depth across a fault that recently had a large amount of slip (about 8 meters). We are using platinum resistance and quartz crystal oscillator thermometers that have an accuracy of about 0.01 degrees or better. The current temperature measurements are being carried out in Hole-A. Simple calculations indicate that there may still be a temperature anomaly of a few tenths of a degree, even 5 years after the earthquake. From an observed temperature anomaly, we hope to be able to determine the apparent coefficient of friction for the faulting process. Estimating the apparent coefficient of friction is important for understanding the mechanics of faulting. The level of friction, and thus the amount of heat produced during an earthquake, has been a controversial issue in seismology for several decades. Timely measurements of the temperature profile across the fault following large earthquakes may be able to answer these long-standing questions about the level of dynamic friction.